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May, 1984

Selection of Preferred Site Phase 2, Stage 2C Final Work Program

**Environmental
Assessment of the
Landfill Component of
Halton's Solid Waste
Management System**

**URBAN DOCUMENTATION CENTRE
RESEARCH UNIT FOR URBAN STUDIES
McMASTER UNIVERSITY
HAMILTON, ONTARIO**

HALTON ENVIRONMENTAL ASSESSMENT
FINAL STAGE 2C WORK PROGRAM
SELECTION OF PREFERRED SITE

1.0 INTRODUCTION

This report consists of the Work Program that would be undertaken in Stage 2C to identify a preferred site for the landfill component in Halton's Solid Waste Management System. The assumptions under which the Work Program has been established include the following:

- . Investigation of six candidate sites for a single site landfilling facility, confirmed by Regional Council as a result of the Stage 2B Consolidation Report, April, 1984.
- . Candidate sites are distributed: three in Oakville, two in Milton, and one in Burlington.
- . The Environmental Assessment process should be independent of the Ontario Waste Management Corporation site selection process.
- . Required landfill capacity of 8.7 million cubic yards, subject to resolution of the EFW project and resultant additional landfill capacity, if any.
- . Preparation of six conceptual plans for landfilling.

This work program incorporates changes that were suggested by various respondents to the Draft Stage 2C Work Program, and changes emanating from comments passed on verbally from a subsequent review by government agencies co-ordinated by the Ministry of the Environment. Further consultation has occurred with the Region of Halton on the approach to Stage 2C and is reflected in the preparation of six conceptual plans for landfilling, an overall review of the estimate of fees, and some Regional involvement in specific tasks, such as transportation, costs (where associated with Energy from Waste), and the planning policy requirements. The significant modifications in the final work program are shown below.

- . Clarification of the current context within which Stage 2C will be undertaken (e.g., EFW Regional Task Force, Ontario Waste Management Corporation).
- . Clarification of additional factors to be considered under the Social Impact Assessment (i.e., noise, dust, litter, traffic);
- . Review of social and cultural factors.

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- . Re-enforcement of the relationship between the public consultation process in Stage 2C, the social impact assessment and the work generated by the consulting team as a whole.
- . Additional material on the purpose and general format of the community workshops.
- . Description of mitigation measures and representative examples.
- . Generic guidelines for a conceptual plan for landfill.
- . Consulting team costs for Stage 2C.

1.1 Ontario Waste Management Corporation (OWMC)

The following resolution was approved by Regional Council on April 18, 1984 regarding the relationship of the Environmental Assessment to the OWMC.

"RECOMMENDATION"

1. That DPD 86/84 on the Implications of the Ontario Waste Management Corporation's Proposals for the Halton Landfill Environmental Assessment Process be received.
2. That OWMC be advised that the position of the Regional Municipality of Halton is to continue to act independently of the Ontario Waste Management Corporation with respect to the Landfill Environmental Assessment Investigation and Analysis but to coordinate public and workshop meeting dates. As well, all information received by each should be public and shared.
3. That Dr. Chant be thanked for his presentation to Council on April 4, 1984 and advised of the Regional Municipality of Halton's position as stated in DPD 86/84.¹

In terms of the study team interaction with OWMC, it is our intention to review technical documents which are available to the consulting team to ensure that our process is complete and that the review of the candidate

¹DPD Report 86/84 re: Implications of the Ontario Waste Management Corporation's Proposals for the Halton Landfill Environmental Assessment Process.

sites is done thoroughly. To date, the background material available from OMMC has included the same general documents available to the general public, which do not address site-specific aspects of their candidate sites in sufficient detail.

1.2 Energy from Waste (EFW) Regional Task Force

The EFW Task Force is proceeding and a draft report on their results of the Preliminary Feasibility Study is anticipated by mid-June, 1984. A review of the landfill component will be undertaken during Stage 2C to determine whether adjustments to the 8.7 million cubic yards are needed as a result of the EFW study.

2.0 OBJECTIVE

The major objective of this stage in the study process is to undertake a comparison of the candidate sites at a site-specific level to identify a preferred site for landfilling. The process of selecting a preferred site will involve a review of hydrogeological information from a drilling program on the sites which have not been previously drilled. A contingency drilling program is also proposed on Candidate Site E (former Site F) to confirm the results of the original drilling program. In addition to the hydrogeological testing, on-site investigations of the biophysical, agricultural and archaeological conditions would be involved in the comparison of the six candidate sites identified in Stage 2B. Economic and social factors will also be considered.

A level of detail of work in the Stage 2C has been established within the framework of the Environmental Assessment Act and is a reasonable level at which to compare the six candidate sites on common grounds. The existing information which existed on Candidate Sites E and F previously

investigated will be reviewed at this stage. It was not considered in the previous site selection stages (namely, the General Overview Analysis and the Selection of Candidate Sites).

Specific tasks are outlined in the following text to indicate, to the reader, the level of investigation proposed to assess the pros and cons of the candidate sites.

It is our intention to bring the level of information on the candidate sites to a common level of detail for Environmental Assessment purposes, and to recommend a preferred site for landfilling at the end of Stage 2C. Two of the candidate sites have been developed at the level of detail expected for an application to implement a landfill site. However, it is not our intention to go to this detailed level for the evaluation of candidate sites in Stage 2C, and this distinction has been discussed with the Ministry of the Environment. Sufficient documentation will be gathered in this stage to narrow down the site selection process to a preferred site. An engineering feasibility analysis of the candidate sites will involve preparation of conceptual design plans for each of the six sites. The conceptual plans are intended to represent a simplified design of a typical landfilling operation but will not be developed to the level of detail required for final design.

Once the preferred site has been selected, further investigation of on-site conditions, particularly hydrogeology, may be required to gain approval for implementation of the site. The Stage 2C analysis will require some on-site hydrogeological investigation of the candidate sites to complement the data gathered in Stage 2A, General Overview Analysis, but this is not intended to be so intensive detailed as a final engineering plan.

During Stage 2C, the public participation program and social impact assessment will proceed with workshop sessions with interested groups and individuals on, and in the vicinity of, the candidate sites. The public participation program for Stage 2C was, in fact, initiated before and during the Public Information Centres in Stage 2B, with the circulation and discussion of the draft Stage 2C Work Program with the draft Stage 2B report.

The initial set of workshops commenced on April 30, 1984, and will be completed by May 25, 1984, preceding consideration of this work program by Council. However, it was felt that the workshops were an important part of Stage 2C which should proceed under the direction of the Director of Planning and Development. The social impact assessment will also draw on local opinions from interested community groups, from a community questionnaire which has been circulated to residents on the candidate sites and within the 1/2 mile study area. A detailed review of the social impact assessment is included in Section 7.

3.0 GENERAL APPROACH

The level of investigation in Stage 2C involves some hydrogeological drilling samples and preparation of conceptual plans for landfilling. On-site biophysical investigation will also be undertaken to confirm the data analysis from previous stages and to identify possible significant biophysical features from the site investigation.

Specific policy and land use planning matters will be addressed under the appropriate regional, municipal, and provincial legislative framework to identify the planning approval procedures required for each of the candidate sites.

The cultural component of Stage 2C will involve field investigation to determine the presence of potential archaeological sites not identified at the level of investigation in Stage 2A or Stage 2B. Heritage features identified within particular candidate sites will be confirmed, and an on-site survey will confirm the presence of any heritage resources that may not have been identified in either the Halton Heritage Study used in Stage 2B or the information received from the Local Architectural Conservation Advisory Committees for Burlington and Oakville.

The agricultural analysis in Stage 2C will generally involve interpretation of aerial photography and on-site investigation to obtain soil surveys. General criteria for site rehabilitation guidelines will be considered in the preparation of conceptual plans.

4.0 EVALUATION FACTORS

The purpose of the evaluation factors in previous stages of the study has been to screen the Region to identify first candidate areas and then candidate sites that would be suitable for landfilling. In the General Overview Analysis (Stage 2A), an overlay mapping technique was used to identify candidate areas, based on stated evaluation factors and available information at the Regional level; and with a primary orientation to hydrogeological suitability.

In Stage 2B, a comparative evaluation approach was undertaken to narrow the candidate areas to identify candidate sites, again based on stated evaluation factors but with more emphasis on factors concerning natural and social and cultural environment, and costs.

The intent of the evaluation factors applied in Stage 2B do not change. However, some of the more site-specific concerns in Stage 2C will involve the following:

- establishment of site-specific study area based on documented impacts that may be expected to occur (an initial study area of 1/2 mile will be carried from Stage 2B, Selection of Candidate Sites);
- best location for landfilling within the "site" area based on hydrogeological and hydrological suitability, natural, social, cultural and economic factors; and

- . update of the landfill volume requirements to encompass a revised 20 year planning period from 1988-2008.²

In Stage 2C, our approach will involve a more detailed comparison of site-specific issues on the candidate sites and would consider the following:

- . hydrogeological suitability;
- . site-specific mitigating measures where necessary and/or appropriate;
- . rehabilitation measures for end-use or concurrent use;
- . siting of transfer station(s), where applicable;
- . designation of potential haul routes, where desirable;
- . local issues and concerns identified from community workshops.

We propose to maintain the six categories in the order of priority established in Stage 2B for the evaluation of candidate sites in Stage 2C, as follows:

- . Public Health and Safety
- . Natural Environment
- . Social Environment
- . Cultural Environment
- . Engineering & Operations
- . Costs

The Public Health and Safety category will be maintained as a first priority to ensure that groundwater and surface water on the candidate site and in the surrounding area are protected. More detailed hydrogeological investigations, involving sub-surface drilling, would be undertaken to confirm the suitability of the candidate sites from a hydro-

²The need for this update of landfill capacity (volume) requirements has been expressed in previous documents based on the general shift in the planning period from 1982 to 1988 to represent the point from which the waste management system is expected to be in place (i.e., Energy from Waste option plus landfill). The update will be developed by the Regional Municipality of Halton in conjunction with the consulting team.

geological perspective. If the test results indicate that any site could not reasonably be mitigated to ensure environmentally safe landfill site, then that site would not be given further consideration.

In the workshops in Stage 2C, discussions will take place with the owners and tenants of properties on the candidate sites and in areas immediately surrounding the candidate sites. The initial set of workshops will be structured to allow for public input on the evaluation factors and to discuss the need for additional evaluation factors that could be applied to all candidate sites. The function of the second set of workshops will be to discuss the perceived social impacts of a potential landfill operation in terms of effects on the community, and impacts of noise, traffic, dust and odour.

The review of the natural environment will consist of two components, namely, the biological and physical terrain, and agriculture. The biophysical component will involve site investigations to confirm the vegetation, wildlife habitat and aquatic systems characteristics of the candidate sites identified in previous stages to determine the site-specific opportunities and possible constraints of each candidate site.

The agricultural analysis will focus on the site-specific attributes of each candidate site for agriculture and, for sites with conceptual plans only, will provide details of site rehabilitation to an agricultural after-use, where applicable and/or appropriate.

The analysis of the social environment potentially affected by landfilling will be given significant consideration in Stage 2C. Various evaluation factors will be incorporated under the social impact assessment, such as noise (along haulage routes and noise generated on-site), dust, litter, and increased truck traffic due to landfilling.

The social fabric of the communities potentially affected by landfilling will be assessed and documented, and the negative effects of change will be addressed in terms of the community's ability to maintain access to

community facilities and to continue their use and enjoyment of such facilities. In addition, the potential effects on special populations, such as the elderly and the disabled, will be addressed.

The engineering and operation of landfilling will be addressed by means of a conceptual plan to determine the on-site constraints and boundary constraints for each candidate site. The conceptual plan will be based on three basic principles to allow for a common level of comparison at each of the six sites, as follows:

- . Site Preparation
- . Site Operations
- . Environmental Controls

Some typical information requirements that would be considered in the preparation of the Conceptual plans are shown below:

Site Preparation

- . buffer and disposal areas
- . topsoil stripping and stockpiling; cover material management
- . access roads, on-site roads
- . security fences
- . surface water management and control
- . buildings
- . screening
- . topographic layout of site (bottom grading and final landform)
- . existing and proposed utilities

Site Operations

- . method of burial and filling
- . daily and final cover application
- . equipment
- . hours of operation
- . staff
- . maintenance
- . progressive rehabilitation/end-use

Environmental Controls (Mitigating Measures)

- . groundwater and surface water monitoring
- . leachate monitoring, collection and disposal
- . gas monitoring and control
- . dust, vector, noise, litter control
- . site rehabilitation and after use

An explanation of the procedures proposed under each category is included in the following text.

5.0 PUBLIC HEALTH AND SAFETY

5.1 Hydrological and Hydrogeological Analysis

The determination of an appropriate hydrological and hydrogeological level of detail for Stage 2C is influenced by the following parameters for the hydrogeological and hydrological investigation:

- . Candidate sites may have to be compared in situations where considerable existing data is available for some (or parts of some) candidate sites as opposed to sites where no specific data has been collected to date. In other words, a comparable level of detail for hydrogeological investigations must be developed from original testing.
- . Field work on the candidate sites may not be able to commence until road restrictions and ground conditions are satisfactory.
- . The need for preparation of conceptual plans.

The approach during Stage 2C, from a hydrogeologic/engineering viewpoint, will be site-specific. However, we will not attempt, during Stage 2C, to develop the level of detail required for approval of a facility on each site under the Environmental Protection Act. Thus, the first priority in Stage 2C will be to confirm that the six candidate sites can be made hydrogeologically suitable for landfilling. Actual test drilling will be done at this stage to confirm the initial hydrogeological studies carried out in Stage 2A and Stage 2B. A comparison between the candidate sites as to their particular advantages and disadvantages from a hydrogeological standpoint will be undertaken to select the most advantageous locations for

landfilling. In addition, and as part of this process, mitigation measures will be considered that should make the operation of a landfill environmentally safe and economical.

The candidate sites selected through Stage 2B includes some lands on which extensive investigation has already taken place. It will be necessary to review this data base at an appropriate level of detail in Stage 2C to enable a comparison to be drawn with candidate sites where a data base has yet to be developed. A contingency drilling program may be enacted on Candidate Site E (former Site F) which have been previously investigated to confirm the environmental safety of the site for landfilling.

To clarify the above, a final design for landfilling already has been developed for some of the lands of the candidate sites; however, we will not be developing such detailed engineering plans for all candidate sites during 2C. Instead, it is intended that a conceptual plan of operation for the candidate sites will be developed during the latter part of Stage 2C, once the drilling and field investigations have occurred.

The following is an outline of the activities proposed for the hydrogeological investigations in Stage 2C. It is intended that a Preliminary Hydrologic and Hydrogeologic Survey will be undertaken in Stage 2C. Sites which for some unforeseen reason may prove hydrogeologically unsuitable for landfilling through this more detailed investigation will not be given further consideration. The steps in such a survey are outlined in sequence below.

5.1.2 Activities for Preliminary Hydrologic/Hydrogeologic Survey

1. Prior to commencement of any field program, the precise properties that are of interest as potential landfill sites must be defined and arrangements made for clear and free access for on-site drilling and testing work.
2. Do a thorough "walk-over" of the six candidate sites to examine drainage and obvious constraints and develop the generalized topography and map showing drainage basins and channels, using available topographic data, maps and air-photos.

3. Compilation of data and existing detailed reports on sites previously investigated, including a detailed review of water well records, review of reports and plans for lands within candidate sites, where such are available, and organization of a field program to supplement data, as required to verify apparent stratigraphic and hydrogeologic characteristics.
4. Field testing including mobilization of equipment, procurement of materials and broad scale test drilling with sampling (a maximum of approximately one test in the bedrock per 25 hectares) and installation of appropriate observation wells, piezometers and surface water monitoring devices.
5. Field monitoring including water level measurements to determine general groundwater regime, collection of water samples for background chemistry of groundwater and surface waters and conduct field permeability testing, where required.
6. Office and laboratory work including visual examination and analysis of soil samples, to verify overburden depth and characteristics and the characteristics of shallow bedrock to determine the availability and suitability of these materials for cover; and including laboratory tests on water samples.
7. Selection of a preferred site from the hydrogeological perspective through compilation and analysis of information so that each candidate site investigated can be compared favourably with each of the other candidate sites pursuant to selection of the preferred option, including mitigating measures.
8. Develop the relationship between site specific conditions and the neighbouring hydrogeology and local water supply sources to determine how these might be impacted by a landfill, including identification of mitigation measures that may be required to allow landfilling to proceed and, particularly, consideration of leachate and gas control.

6.0 NATURAL ENVIRONMENT

6.1 Biophysical Terrain Analysis

The biophysical investigation will be undertaken to confirm the vegetation, wildlife habitat, and aquatic systems conditions of candidate sites established in previous stages. Extensive inventories will not be undertaken.

Sufficient data will be acquired to permit evaluation and comparison of the opportunities and constraints which each site offers to a municipal landfill.

Vegetation - The vegetation communities on each site will be mapped from the field survey. The type, extent, relative health, disturbance history and "naturalness" of the various community types (e.g., forest, scrub, meadow, etc.) will be determined, along with the physical conditions (e.g., soil, drainage) of that area. Plant species identification will be undertaken to determine the composition of the various communities. The status (e.g., "rare", "significant") of the plants, both regionally and provincially, will be addressed.

Wildlife Habitat - The vegetation community characteristics and the known range of various animals will be reviewed to confirm the wildlife habitat capabilities of the candidate sites. The role that a site may play in a movement corridor of wildlife will also be assessed. Sightings and signs (e.g., browse marks, droppings, etc.) of animal species will be recorded during site visits, but no specific wildlife inventories or field investigations will occur.

Aquatic Systems - In conjunction with the hydrology work discussed in Section 5.1.2, items 2, 4, 5, and 6, every stream on and in the immediate vicinity of a candidate site will be examined to determine required set-backs for buffer areas, or acceptable modifications to the drainage pattern. For this purpose, the biological function (e.g., for fish spawning) and the current downstream uses (e.g., for livestock watering) of the water courses will be considered.

In addition to evaluating and comparing the capabilities of the sites, mitigating measures that could be established to minimize or eliminate potential adverse impacts of landfill operations will be investigated. The biophysical components will be addressed from the perspective of protecting these resources, and also in terms of their capabilities to ameliorate other impacts (e.g., as a litter or visual buffer). The following is a list of some of the types of mitigating measures that will be examined:

- . Identify locations where a vegetation buffer should be established. The vegetation structure (e.g., shrubs, trees) and plant species types that are most suited to withstanding the potential impacts of the landfill operation (e.g., dust) and providing visual screening will be determined.
- . Examine potential for on-going re-vegetation (especially with trees) of the landfill site, as sections are filled.
- . Determine methods to minimize site attraction for birds and vermin.

The tasks that will be undertaken to acquire, evaluate and document the information include:

- . Establishing an appropriate evaluation and comparison method.
- . Airphoto interpretation.
- . Review of existing detailed documents for parts of Candidate Sites E and F, that have been investigated previously.
- . On-site investigation of terrain characteristics, and for plant species identification.
- . Meetings with MNR and HRCA representatives, both in their offices, and on the sites to deal with site-specific matters, such as setbacks from streams).

6.2 Agricultural Analysis

The following tasks are proposed for a detailed comparison of the candidate sites:

1. Airphoto interpretation of agricultural site conditions.
2. Soil surveys (five profile examination points per 100 acres as a rule of thumb).
3. Soil sampling.
4. Site-specific land use/crop system survey (assessment data).
5. Site visit to resolve biological/agricultural interface.

6. Establishment of general engineering criteria for development and management guidelines for rehabilitation to agricultural after-use, where appropriate.
7. Review of landfill gas impact on crop productivity.
8. Preparation of report and mapping.

Mitigation measures which would typically be considered for rehabilitation to agricultural after-use include the following:

1. Appropriate depth of topsoil and subsoil application over the final landfill is critical to overall success of rehabilitation (conceptual plan).
2. With exception of side slopes, final grading contouring of area slopes must accommodate surface drainage and runoff with appropriate outlet (conceptual plan).
3. Progressive rehabilitation of the site minimizes the amount of disturbed area at any one time during the landfill operation.
4. Addition of green manure and/or animal manure to topsoil, together with standard fertilization enhances soil productivity.
5. Mechanical ripping with agricultural subsoiler, following application of subsoil and topsoil, alleviates adverse soil compaction in the rooting zone.
6. The post-construction cropping program would include several seasons under a grass-legume system, followed by rotation with cash crops.
7. A post-rehabilitation monitoring program would be implemented to include assessment of soil compaction, fertility, crop establishment, gas levels and differential soil subsidence.
8. Side slopes will be designed to a degree of steepness suitable for application of erosion control measures.
9. Surface runoff would be directed to appropriate treatment areas prior to release to downstream water systems, in order to prevent siltation or pollution impairment of downstream surface water quality.

7.0 SOCIAL ENVIRONMENT

7.1 Social Analysis

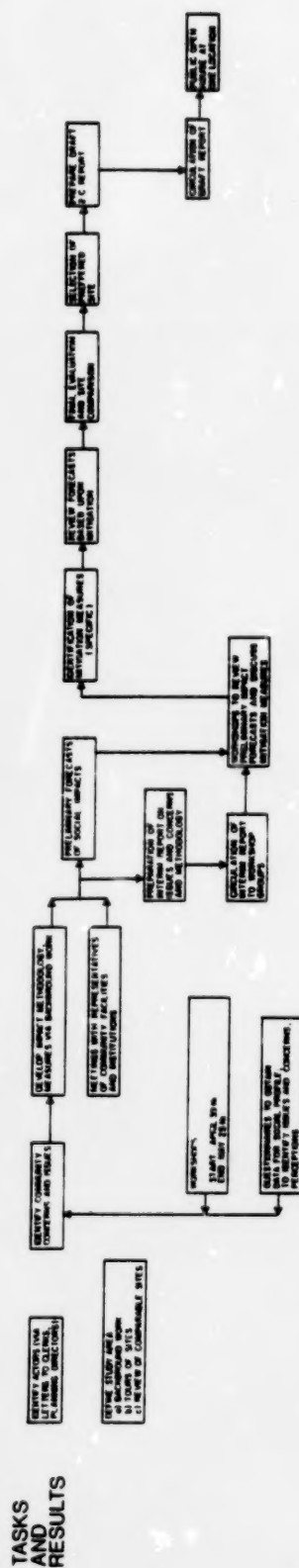
The Final Work Program for the Environmental Assessment for Landfill (May 1983) makes provision for the preparation of a Social Impact Assessment and for the involvement of the public in the comparison of selected candidate sites for landfill. These two elements of the Stage 2C work program are closely interconnected, in that the social impact assessment will depend to some extent on the exchange of information and views afforded by the public participation program. For the purpose of this work program, both elements are combined into essentially one program. Figure One illustrates the sequence of events and timing for the Social impact assessment, community workshops, and opportunities for public input to the preferred site.

7.1.2 Social Impact Assessment

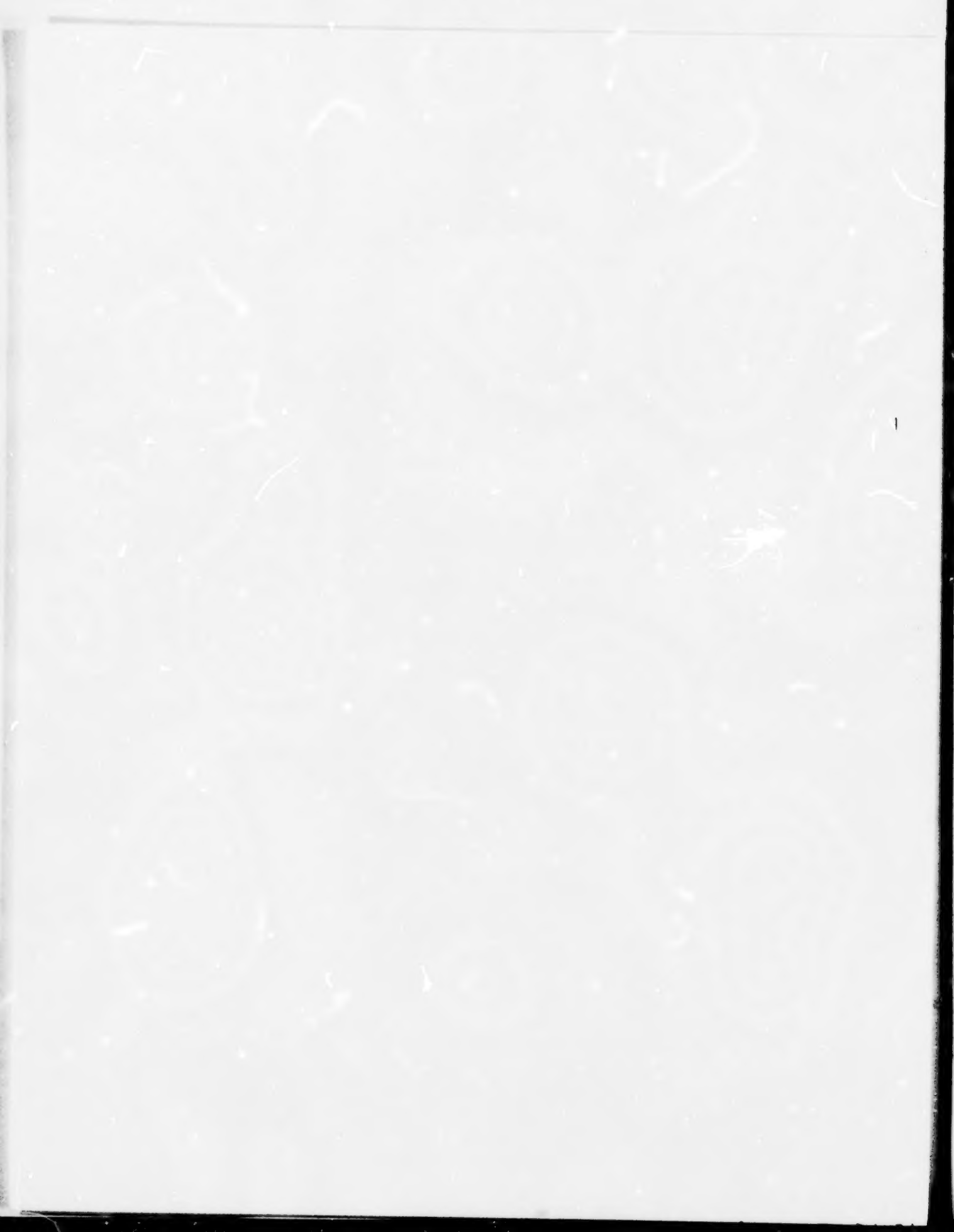
It is intended that the following tasks will be undertaken within study areas identified in Stage 2B, but possibly refined for the purpose of Stage 2C:

1. Information will be assembled for each of the candidate sites by means of a questionnaire sent to the "communities" affected (i.e., residents and organizations of the areas on, and in the vicinity of, the candidate sites), and through the collection of data such as census, background documentation, and so forth. Social profiles will be developed from this information.
2. Identify participants for workshops, develop baseline data.
3. Community concerns and issues with respect to each candidate site will be identified and reviewed (workshops/questionnaires).
4. An Interim Report on concerns and issues will be prepared and circulated. This will assess community concerns and issues, and define the social impact methodology.
5. The social impact measures will be used to prepare a preliminary forecast of possible social impacts at each site, and input

FIGURE ONE: WORK PROGRAM - SOCIAL IMPACT ASSESSMENT AND PUBLIC PARTICIPATION



SCHEDULE | April | May | June | Mid-July | August | September |



concerning possible mitigation measures will be sought through community workshops. These workshop sessions are planned for mid-July, as shown on Figure One.

6. The social impact forecasts and mitigation measures will be revised in light of input received from the community, and impacts will be described and compared. See Figure One.
7. A final review and identification of possible mitigation measures will be undertaken. See Figure One.
8. The final site evaluation will be undertaken to identify the preferred site in conjunction with other factors.
9. Public Information Centres will be held to present the results of the Stage 2C analysis.

The Social Impact Assessment would address such issues as noise, dust, litter, odour, and concerns about traffic and water supply.

7.1.3 Factors Related to Social Impact

The following factors will be addressed under the social impact assessment in Stage 2C. Data will be gathered by qualified consultants and translated in terms of the social effects on the community.

a) Noise

The impact of a landfill site on the sound environment will be addressed from two aspects: (i) the noise impact of the road traffic generated by the site; and (ii) the noise impact of the equipment associated with the landfill operation.

In order to assess the potential noise effects at a candidate site, and along haul routes, the predicted future sound levels will be compared to the present conditions and to relevant noise standards and criteria. The information that is necessary for this assessment will be acquired through field investigations and by integrating data from other team members. The specific information is listed below.

i) Road Traffic Generated Noise

For haulage routes to the site, from a major artery:

- . traffic volume now and projected;
- . projected traffic volumes and types related to landfilling;
- . traffic flow speed;
- . road surfaces;
- . road grades, and off-road topography;
- . location and type of buildings along roads.

ii) On-Site Generated Noise

- . existing sound environment, determined from existing land use;
- . survey of existing noise sources;
- . location and number of nearby residences or other sensitive land uses (distance, direction);
- . existing potential acoustical barriers on and around site, e.g., topography, vegetation, intervening structures, etc.;
- . types of activities related to landfilling;

From this information, predictions of changes in sound exposure along the haulage routes and around the site will be calculated, using a production model for a general landfill site of the magnitude projected for Halton. No sound level measurements will be obtained.

The evaluation of the potential noise effects will take into consideration mitigating measures which, if implemented, would reduce adverse impacts. Such measures as the following will be investigated:

- . Establish berms and/or acoustic barriers around candidate sites;
- . Designate truck haulage routes and place truck traffic bans on other roads.

b) Air Quality

This category includes litter, particulates (e.g., dust) and odour components. Since, at any landfill site, the potential for generation of each of these components is relatively the same, the investigation will concentrate on ascertaining (i) existing conditions; (ii) characteristics that influence dispersion from a site; and (iii) mitigating measures that would reduce adverse effects. The types of mitigating measures that will be considered are listed below:

- . existing potential dispersion and visual barriers on and around a site, e.g., topography, vegetation, intervening structures;
- . establishment of litter fences and/or litter patrols;
- . establishment of special procedures for "high wind" periods;
- . methods to minimize odour (e.g., rate and type of cover material).

7.2 Land Use Planning Analysis

Stage 2C is considered in land use planning terms for implementation of the candidate sites.

The general issues to be addressed for the land use planning component during Stage 2C include the following:

- . possible end uses or concurrent uses for candidate sites, based on local conditions, and existing planning policies;
- . detailed planning assessment of the use of the candidate site for landfill including the nature and extent of requirements for

Official Plan Amendment(s), zoning amendment(s) and/or site plan control, depending on plans of individual area municipalities, the Region, and Provincial policies, and guidelines;³

- . on-site inspection of detailed land use;
- . detailed property ownership of candidate site(s).

8.0 CULTURAL ENVIRONMENT

8.1 Archaeological Analysis

Objectives

The investigation of archaeological resources in Stage 2C is intended to clarify the location and extent of any archaeological resources existing on the six candidate sites identified in Stage 2B. This will involve documentation of known archaeological resources, and an archaeological surface survey of cultivated fields and sites.

8.1.2 Work Program

- . Interpretation of artifacts from known archaeological sites using files of the Royal Ontario Museum and Ministry of Citizenship and Culture.
- . Archaeological surveys will be conducted to investigate known archaeological sites, to map artifacts, and to thoroughly examine cultivated areas within the candidate sites.
- . A report will be prepared which will outline the activities conducted in Stage 2C. The precise areas surveyed will be defined, and artifacts and archaeological sites which were previously known or discovered by survey will be described and

³It should be noted that the relative status of guidelines, whether municipal or provincial, must have a lesser influence than approved policies and plans.

mapped. Recommendations will be provided concerning the need or desire for mitigation or avoidance of archaeological sites and the need for additional work, if any.

The Stage 2C work program is designed to investigate all candidate sites in terms of the lands where the ground is exposed.

8.2 Heritage Resources

The following tasks will be undertaken for the Stage 2C analysis:

- . Site visits will be undertaken to confirm the locations of heritage features identified in Stage 2B, and to identify any further heritage features.
- . Each feature will be investigated and evaluated with respect to its particular characteristics, and its significance at the local and/or Regional level.
- . The extent of any conflict between heritage features and the implementation of sanitary landfilling on the candidate sites will be evaluated, and recommendations with respect to mitigation measures will be made where appropriate.
- . Assistance will be sought from Local Architectural Conservation Advisory Committees and municipal officials in determining the significance of heritage features, and in the consideration of mitigation measures.

8.3 Visual Analysis

In order to address the potential visual impact for all candidate sites, we propose to review the following factors:

- . documentation of present visual context with respect to views through photographs and field investigation;
- . review of special activities in the vicinity of candidate sites that may potentially be affected by a landfill operation (e.g., recreation opportunities);

- . review of changes in visual perspective due to changes in site elevation (e.g., present vs. final contours);
- . identification of possible mitigation measures to reduce adverse effects of landfilling such as progressive rehabilitation of landfill, buffering, operations and end use planning.

9.0 ENGINEERING AND OPERATIONS

9.1.1 Conceptual Plan of Landfill Operation

The development of a conceptual plan of landfill operation would be undertaken once site-specific hydrogeological conditions are defined through the data review and testing drilling program outlined in Section 5. The conceptual plan will be used to identify off-site constraints and required mitigating measures. In addition, the conceptual plans will in part form the basis for a cost comparison of candidate sites.

Mitigation measures that might be considered from the operational engineering standpoint include:

- . monitoring of groundwater, surface water, and landfill gas monitoring;
- . leachate collection, transmission and treatment systems;
- . sediment ponds on-site to protect surface waters from unacceptable sediment loads;
- . container stations for public drop-off;
- . landfill gas collection and subsequent incineration;
- . progressive site rehabilitation.

9.1.2 Transportation Analysis

The following work tasks are proposed for the detailed site comparison of the transportation component in Stage 2C:

1. Finalize trip starts.

2. Determine point of entry to each candidate site to finalize haulage route trip destination.
3. Finalize haulage routes.
4. Collect detailed information on haul routes, such as intersection conditions, pavement shoulder widths, right-of-way widths.
5. Assess existing and future traffic volume along proposed haulage routes.
6. Generate haulage truck volumes along haulage routes.
7. Assess potential traffic conflicts with adjacent land uses.
8. Develop minimum acceptable road standards for haulage routes.
9. Prepare travel time and distance calculations.
10. Finalize road improvements and cost requirements associated with each haulage route.
11. Assess transportation impacts at each candidate site.

The following list of typical mitigating measures could be applied to reduce traffic service and safety impacts.

1. Improve road geometry (horizontal and vertical alignment) to acceptable standards.
2. Intersection improvements (e.g., lane additions, channelization, signalization, illumination) to accommodate truck traffic.
3. Improve road surface (i.e., pave existing gravel roads).
4. Improve road cross-section (e.g., road widening, shoulder widening).
5. Specify reduced speed limits in potential conflict areas.
6. Designation of haulage routes.

10.0 COSTS

10.1 Economic Analysis

A description of the cost components in Stage 2C and approach to the cost analysis is shown below:

10.1.1 Detailed Cost Research

1. Develop detailed operating cost method and procedures and assumptions which can be applied to each site.
2. Evaluate transfer station alternatives in more detail, regarding location and cost allocation.
3. Evaluate haul costs in terms of actual staff and truck costs for municipal and private haulers and costing for "small haulers".
4. Finalize inflation and discount assumptions, considering a variable inflation rate for sensitivity analysis.
5. Revise financial framework to a total annual cash flow approach.

10.1.2 Integration of Landfill and Energy from Waste Cost Analysis

The coordination between the Environmental Assessment of the landfill component and the Energy from Waste Task Force is important in Stage 2C since final conclusions must be reached with respect to landfill capacity (volume) requirements; total system costs;⁴ update of solid waste forecasts to consider update report done in Fall 1983 by C.N. Watson and Associates Ltd. and the extended planning period, and the outcome of the 1983 Interim Waste Plan.

⁴EFW analysis using Stage 2B for cost analysis information and landfill at Stage 2C level.

Liaison between the consulting team economist and Regional staff and consultants responsible for the EFW will be maintained to undertake the above review.

10.1.3 Costs of Landfill Alternatives

The costs of each of the six candidate sites will be developed using the Stage 2B cost criteria as follows:

1. Site capital costs.
2. Site operating costs.
3. Haul costs.
4. Property value impacts.
5. Indirect economic impacts.
6. Costs for mitigation measures.

A qualified land appraiser will be involved in item 4 above. In addition, the distribution of costs will be addressed according to who will bear such costs. In items 1 and 2 above the option of public vs private operation of a landfill will be considered.

10.1.4 Mitigation Measures

The cost of typical mitigating measures include the following:

- . buffering, berming, and landscaping;
- . haulage route controls;
- . contingency measures re water supply;
- . litter control;
- . compensation;
- . management measures;

With respect to compensation, the following approach would be taken in developing recommendations for compensation policies:

- . Define the area which may be impacted by the landfill site (noise, dust, litter, and so forth).

- . Assess the potential for change in property values for different types of land uses (rural residential, agricultural, commercial and industrial if necessary).
- . Review municipal practice in comparable situations.
- . Examine the legislation governing expropriation and compensation and the case precedence as well as previous Regional, Provincial, Ontario Hydro approaches to the issue.
- . Define alternatives for compensation for the Region to consider.
- . Present recommendations on compensation policy.

10.1.5 Sensitivity Analysis

Financial conclusions would be drawn using a variety of different assumptions for the cost variables. Where the results are most affected by variable shifts, the likelihood of different values would be explored to develop reasonable ranges.

Finally, a system to clearly identify the way in which cost and benefit trade-offs were addressed will be developed with the consulting team. The system will be similar to that employed in Stage 2B but should be responsive to the Stage 2C results as well.

11.0 SELECTION OF PREFERRED SITE

This section describes the method for applying the assessment of the six candidate sites from Sections 5-10. The first step will involve a detailed evaluation of the physical, social, cultural, natural, and economic environments potentially impacted by landfilling. It is our intention, as in previous stages, to try to avoid any unnecessary disruption of significant features on the candidate sites and in the surrounding area potentially affected by landfill.

Secondly, the extent to which mitigation measures may be shown to reduce the impacts of landfilling will be considered in the selection of a preferred site. Costs for mitigation measures will be included in assessing the candidate sites.

The comparison of the sites will be based on the extent of potentially adverse effects that remain, after mitigation. The site-specific advantages of individual candidate sites would also be compared to determine sites that would be more favourable for landfilling.

Since the evaluation in Stage 2C will involve a detailed site comparison of each candidate site, the relative advantages and disadvantages of each site will be identified. The weight that will be assigned to potential adverse impacts will depend on the extent and severity of such impacts and whether or not mitigation measures will significantly reduce the impacts. Impacts that would remain fairly consistent at all sites will not be given significant weight in the overall ranking of sites. However, Public Health and Safety will remain as the highest priority category in the evaluation of each site. The other categories included, in order of priority, are as follows:

- . Public Health and Safety
- . Impact on Natural and Biophysical Resources
- . Social Impact
- . Impact on Agriculture
- . Impact on Cultural Environment
- . Engineering and Operations
- . Costs

Following the identification of the preferred site, a draft Stage 2C report will be circulated to the public, agencies, interest groups, and individuals for comment. The draft report will include the results of the detailed comparison of the candidate sites, the ranking of each site from "most preferred" to "least preferred" and the reasons used by the consulting team for the rankings. The document will be structured so that each site can be shown separately in terms of the comprehensive list of evaluation factors. Each site will initially be assessed on its own merits

to determine whether there are site-specific constraints for landfilling and then a comparative evaluation of all sites will be undertaken to determine the relative ranking of the sites. A final recommendation for the preferred site will be included as well as recommendations for further work that may be required to take the preferred site to implementation.

Submissions from the public, agencies, interest groups, and individuals on the draft report at the end of August, 1984, will be accepted and reviewed by the consulting team. An opportunity will be provided for public input at two Public Information Centres in September 1984 following the submission of the draft Stage 2C Report to the Solid Waste Management Committee. Changes to the draft report will be considered and a final Consolidation Report will be issued. These procedures are consistent with the approach used in all previous stages of the Environmental Assessment study.

12.0 ESTIMATE OF FEES12.1 PUBLIC HEALTH AND SAFETY/ENGINEERING AND OPERATIONSHydrological and Hydrogeological Analysis - Hydrology Consultants
Conceptual Plans

ACTIVITIES	Staff and Man-Days			
	Principal	Senior Hydrogeologist/Engineer	Intermediate Hydrogeologists	Technical/Drafting
1. Detailed Planning	1	2	3	-
2. Reconnaissance & Mapping	-	3	6	2
3. Data Compilation & Review	2	3	10	2
4. Field Testing & Instrumentation	1	2	10	20
5. Field Monitoring & Measurements	-	1	10	20
6. Office & Lab Analysis (samples)	-	3	1	4
7. Selection of Preferred Sites for Conceptual Plans	1	2	2	-
8. Hydrogeologic Relationships	1	5	10	5
9. Conceptual Site Plans	9	12	-	12
10. Preparation of Reports	2	5	10	10
11. Interface/Team* Agencies/Public	4	6	5	-
12. Workshop Sessions	-	12	-	-
13. Interrogatories	1	3	5	-
14. Cost Estimating	<u>1</u>	<u>1</u>	<u>6</u>	<u>-</u>
	17	60	78	75
Cost (\$)	10,200	30,000	24,960	19,650

*The Estimate for Time/Cost at Meetings is estimated. Expenditures beyond this Time Estimate would be an Extra.

Continued

15. Contingencies for
Drilling Site

E	-	<u>1</u>	<u>2</u>	<u>6</u>
Sub Total	-	1	2	6
Cost (\$)		\$500	\$640	\$1,575
TOTAL	17	61	80	81
Cost (\$)	10,200	36,500	25,600	21,225

SUB-TOTAL COST:

\$ 87,525Disbursements

a) Mobilization/Drilling and Materials 32x45 ft x \$12.50/ft.	\$18,000
b) Day work - 30 hrs. x \$70	2,100
c) Lab Work Soil/Water (Soil - say 50 samples x \$75) (Water - say 30 samples x \$75)	3,750 2,250
d) Field Expenses (Estimate \$40/day for 40 days)	1,600
e) Other Expenses (Supplies, typing, drafting, photos, materials, mileage to meetings) Estimate	<u>1,000</u>
SUB TOTAL:	\$28,700
f) Contingency for Deep Stratigraphic Testing on Site D if required Mobilization/Drilling & Materials 2 holes to 200 feet continuous sampling	<u>\$ 9,000</u>

TOTAL DISBURSEMENTS: \$37,700

TOTAL COST ESTIMATE

\$125,225

Traffic Service and Safety - Giffels Associates Limited

<u>ACTIVITIES</u>	<u>Estimate of Man Hours</u>
1. Finalize Trip Starts - Region of Halton	-
2. Finalize Site Access Locations - Region of Halton	-
3. Finalize Haulage Routes - Region of Halton	-
4. Collect Detailed Information Along Haulage Routes	40
- intersection conditions,	
- geometry (horizontal & vertical alignments)	
- pavement/shoulder widths	
- drainage conditions	
- right-of-way widths	
5. Assess Traffic/Travel Aspects Along Each Route	40
- potential traffic conflicts	
- adjacent land uses	
- identification of sensitive areas	
6. Develop Haulage Route Engineering Criteria	10
- minimum acceptable road standards	
7. Structural Assessment	30
- determine structural deficiencies (pavement, road bed, drainage, etc.) to identify reconstruction requirements	
8. Finalize Road Construction Requirements Associated with Each Route	20
9. Cost Estimate	30
- for road construction	
10. Evaluation and Impact Assessment	30
11. Report	20
12. Project Team Responsibilities	15
- meetings	
13. Public Information Centres	15
	<u>250</u>

Estimate of Engineering Costs (\$50/hr.) = 250 x \$50 per hour \$12,500

12.2 NATURAL ENVIRONMENTBiological Terrain and Air Quality Analysis - Bird and Hale Limited

<u>ACTIVITIES</u>	<u>Staff and Man-Days</u>			
	<u>Principal</u>	<u>Ecologist</u>	<u>Botanist</u>	<u>Technician</u>
1. Airphoto interpretation	2	1		1
2. Sites investigations, sites visits and meetings with MNR and HRCA staff	4	7	6	-
3. Document review and integration of data from other team members	1	4	1	5
4. Evaluation method & evaluation	3	3		
5. Team meetings	2	4		
6. Reporting	2	6	2	4
7. Public Information Centres	—	<u>2</u>	—	—
Total Man-Days	14	27	9	10

ESTIMATE OF FEES:

Principal @ \$550 x 14 = \$7,700

Ecologist @ \$350 x 27 = 9,450

Botanist @ \$350 x 9 = 3,150

Technician @ \$200 x 10 = 2,000TOTAL \$22,300

Agricultural Analysis - Ecological Services for Planning Ltd.

ACTIVITIES	Staff and Man-Days			
	Principal	Project Manager	Principal	Technician
1. Establish Terms of Reference for Stage 2C Work Program	0.50	3.00	0.25	
2. Aerial Photo Interpretation (requires aerial photos from L. Helas)		0.25		2.00
3. Soil Survey (2 profile examination points/100 acres, at rate of 15 points or 600 acres/day, plus travel time)	0.50	0.25		12.00
4. Soil Sampling	1.00	0.25		2.00
5. Site Specific Land Use/Crop System Survey, Assessment Data		1.00		3.00
6. Site Visit with L. Helas to resolve Biological/Agricultural Interface		1.50		
7. Soil Sample Lab Analysis				2.00
8. Data Analysis and Synthesis/Internal-External Site Comparison	1.00	3.00		
9. Establish Site Development and Management Guidelines	3.00	2.00	1.00	3.00
10. Meetings with HAAC & OMAF	1.00	2.00		
11. Three Study Team Meetings	2.00	3.00		
12. Site Planning Meeting with Hydrogeologist, Economist, Appraiser & Sociologist	1.00	1.00		

<u>ACTIVITIES</u>	<u>Principal</u>	<u>Project Manager</u>	<u>Principal</u>	<u>Technician</u>
13. Address Concerns Related to Landfill Gas Impact on Crop Productivity	1.00	0.25		2.00
14. Draft Report Writing & Edit	3.00	7.00	0.75	3.00
15. Draft Maps & Field Sheets		1.00		2.00
16. Project Management	4.00	10.00		
	<u>18.00</u>	<u>35.50</u>	<u>2.00</u>	<u>31.00</u>

ESTIMATE OF FEES

Professional Fees -	18.00 days at \$425 =	\$ 7,650.00	
	35.50 days at \$275 =	9,762.50	
	2.00 days at \$425 =	850.00	
	31.00 days at \$175 =	<u>5,425.00</u>	\$23,687.50
Clerical Fees	14.00 days at \$115 =	\$ 1,610.00	
Technical Fees	10.00 days at \$160 =	1,600.00	
Crop Specialist (Gas Impact)	1.00 day at \$450 =	<u>450.00</u>	3,660.00
One (1) Public Information Centre at \$425 per session		425.00	
			<u>425.00</u>
		<u>TOTAL FEES</u>	<u>\$27,775.00</u>

The above budget is based on the following assumptions:

1. Disbursements or out-of-pocket expenses are billed at cost as an extra budget item (estimated at approximately \$2,000, for soil sample lab analysis, travel, photocopy and printing cost, telephone, etc.);
2. Base Maps and Aerial Photography will be supplied by the Client;
3. Time to Review and Respond to Public and Agency Comments related to Stage 2C will be billed at regular per diem rates as an extra budget item (estimated at approximately \$2,000).

12.3 SOCIAL ENVIRONMENT

Social Impact Assessment and
Public Participation - Myra Schiff Consultants Limited

<u>ACTIVITIES</u>	<u>Team Member</u>	
	<u>Principal</u>	<u>Junior</u>
1. Define Study Area	3	
2. Identify actors for workshops, develop baseline data	6	4
3. Identify concerns and issues		
a) Workshops	12	4
b) Questionnaires	14	11
4. Develop impact methodology	8	
5. Meetings with community facilities and institutions. (Based on assumption of 1 day per facility to arrange meeting, hold meeting and write up, and estimating 10 institutions/facilities to visit for Principal. Junior to see to production and distribution of minutes of meetings, etc.)	10	5
6. Prepare Interim Report on Concerns and Issues, Methodology	6	4
7. Preparation of preliminary forecasts	12	6
8. Workshops on Mitigative Measures	12	4
9. Revised Impact Forecasts	3	6
10. Final Site Evaluation	4	
11. Preparation of Draft Report	6	3
12. Preparation of Summary Report	3	3
13. Public Information Centres	3	2
14. Response to Draft 2C Report and write up of Public Information Centres	5	3
	107	55

Myra Schiff Consultants Limited (continued)ESTIMATE OF FEES

Principal:	107 days @ \$500/day	53,500
Junior:	55 days @ \$250/day	<u>13,750</u>
		<u>\$67,250</u>

NOTES

1. Costs for computer analysis of the questionnaires is not included. This will depend in part on whether we use your computer or go to another source, and this cannot be determined at this time.
2. It is assumed that printing and mailing costs will be absorbed by the Region.
3. It is assumed that WWY will be responsible for graphics, drafting of panels, preparation of maps, photographs, etc. necessary for the Public Information Centres.
4. Costs for meetings with the Region, the Ministry of the Environment and the study team are not included in this budget because of the difficulty in estimating the number of such meetings.
5. For the same reason, there are no estimates for expenses such as telephone, mileage, courier, etc. associated with this project.

Noise Impact Analysis - Barman, Coulter, Swallow Associates

<u>ACTIVITIES</u>	<u>Man-Days</u>
1. Evaluation of current background sound levels	2
2. Identification of sensitive areas	1
3. Preparation of prediction model for noise propagation to determine site generated sound levels	5
4. Evaluation of noise impact on haulage routes	1
5. Evaluation of extent of impact due to site operations and along haulage routes and mitigation measures	1
6. Report Preparation	<u>3</u>
	13
Expenses \$85	

Estimate of Fees:	13 days @ \$455 = \$5,915
Expenses	<u>85</u>
	<u>\$6,000</u>

Land Use Planning Analysis

- Walker, Wright, Young Associates Limited

<u>ACTIVITIES</u>	<u>Team Member</u>			
	<u>Principal</u>	<u>Senior Planner</u>	<u>Planner</u>	<u>Senior Draftsman</u>
1. Preparation of Final Stage 2C Work Program	8	12	2	7
2. Identification of possible end uses	4	4	12	5
3. On-site inspection of detailed land use	5	6	-	11
4. Study Team Meetings and Liaison	10	10	9	-
5. Workshop Sessions		14	4	6
6. Project Management and Coordination	25	30	-	-
Total Man Days	52	76	27	29

Estimate of Fees

Principal	52 days @ \$675 =	\$35,100
Senior Planner	76 days @ \$375 =	28,500
Planner	27 days @ \$263 =	7,100
Senior Draftsman	29 days @ \$300 =	<u>8,700</u>
		<u><u>\$79,400</u></u>

12.4 CULTURAL ENVIRONMENT

Archaeological Analysis - Museum of Indian Archaeology (London)

1. Documentation of existing (known) Archaeological Sites

Project Archaeologist - 14 hours @ \$50 per hour	\$ 700
Expenses	<u>200</u>

TOTAL STEP 1	\$ 900
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2. Archaeological Survey of Cultivated Fields in Six Candidate Sites

Consulting Archaeologist - 5 hours @ \$78 per hour	\$ 390
Project Archaeologist - 168 hours @ \$50 per hour	8,400
Field Assistants - 168 hours @ \$22.50 per hour	<u>7,560</u>

16,350

Equipment and Supplies	800
Travel and Accommodation	<u>3,240</u>

TOTAL STEP 2	\$21,720
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3. Analysis and Report Production

Consulting Archaeologist - 2 hours @ \$78 per hour	\$ 156
Project Archaeologist - 35 hours @ \$50 per hour	1,750
Clerical - 10 hours @ \$20 per hour	200
Lab Assistant - 35 hours @ \$22.50 per hour	<u>788</u>

2,894

Supplies	200
Graphics - production of site maps, maps of artifact distribution including original line drawings, PMT's	<u>500</u>

TOTAL STEP 3	\$3,594
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TOTAL STEPS 1, 2, 3	<u><u>\$26,214</u></u>
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Visual Impact Analysis - The Landplan Collaborative Ltd.

<u>ACTIVITIES</u>	<u>Landscape Architect</u>	<u>Technician</u>
1. Field Investigation, (6 sites) photographs of views; integration of environmental data on topography vegetation; calculation of elevations	12	5
2. Liaison with study co-ordinators	2	
3. Preparation of perspective plans of visual impact and issue area identification	4	4
	—	—
	18	9

5. Expenses - \$250.

TOTAL MAN DAYS

Estimate of fees 18 days @ \$300 = \$5,400
 9 days @ \$200 = \$1,800
 \$7,200
 250
 \$7,450

Heritage Analysis - The Landplan Collaborative Ltd.

1. Field investigation of specific heritage features on-site and in the immediate vicinity	6	3
2. Mapping of location of buildings; interpretation and analysis	4	2
	<u>10</u>	<u>5</u>

Estimate of fees 10 days @ \$400 = \$4,000
 5 days @ \$200 = 1,000
 \$5,000

12.5 ECONOMIC ENVIRONMENT - C.N. Watson and Associates Ltd.

1. Cost Research	- 9 days @ \$540 per day	\$4,860
2. Integration of Landfill and EFW Analysis	- 6 days @ \$540 per day	3,240
3. Costing of Alternatives	- 10 days @ \$540 per day	5,400
4. Cost of Mitigating Measures	- 6 days @ \$540 per day	3,240
5. Recommendations for Compensation	- 4 days @ \$540 per day	2,160
6. Conduct Sensitivity Anal- ysis for Key Variables	- 3 days @ \$540 per day	1,620
7. Define Overall Decision- Making Methodology	- 3.5 days @ \$540 per day	1,890
8. Report Preparation	- 6 days @ \$540 per day	3,240
9. Public Information Centres	- 2 days @ \$540 per day	1,080
10. Study Team Meetings	- 6 days @ \$540 per day	3,240
Estimate of Fees	- 55.5 days @ \$540 per day	<u>\$29,970</u>
	TOTAL	<u><u>\$29,970</u></u>

The total estimated fee of all study components proposed in Stage 2C is shown below:

	<u>Estimated Budget</u>
1. Hydrogeological and Hydrological Analysis/ Engineering and Operations	\$125,225.00
2. Transportation	12,500.00
3. Biological Terrain Analysis	22,300.00
4. Agricultural Analysis	27,775.00
5. Social Impact Assessment and Public Participation	67,250.00
6. Land Planning Analysis/Project Co-ordination	79,400.00
7. Visual Impact and Heritage Analysis	12,450.00
8. Noise Impact Analysis	6,000.00
9. Archaeological Analysis	26,214.00
10. Economic Analysis	<u>29,970.00</u>
	\$409,084.00

Disbursements are generally not included in the above budget estimates except where additional test drilling, manpower, equipment and expenses related thereto are shown on the individual sections.

The figure of \$409,084 is an estimated fee and is based on the program which we feel is required in Stage 2C. The figure is not intended as an upset limit, however, and represents our best estimate at this time of the requirements for Stage 2C.